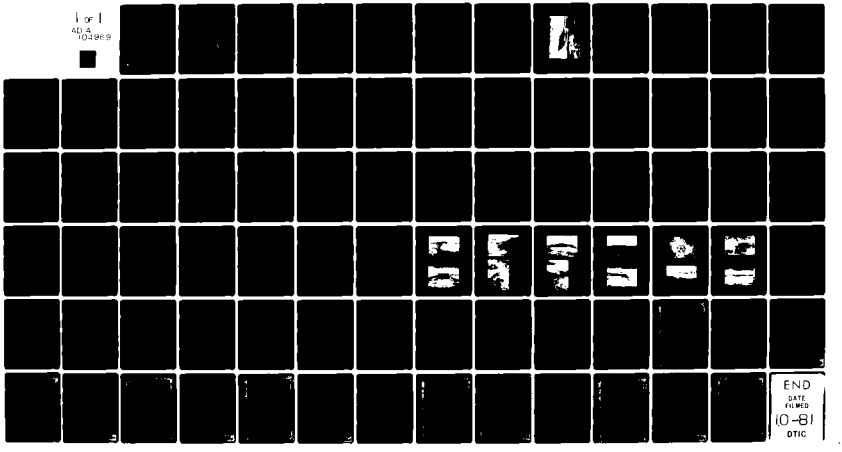
AD-A104 969 PRC CONSOER TOWNSEND INC ST LOUIS MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. B & K LAKE NUMBER 2 DAM (MO 11002)--ETC(U)
DEC 79 W G SHIFRIN DACW43-79-C-0075
UNCLASSIFIED NL



LEVEL II

MISSISSIPPI · KASKASKIA · ST. LOUIS BASIN

AD A104969

B & K LAKE NO. 2 DAM
WARREN COUNTY, MISSOURI
MO. 11002

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

St. Louis District

"Original contains color plates: All DTIC reproductions will be in black and white"

PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

DECEMBER 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A104969 / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program B & K Lake No. 2 Dam (MO 11002) Warren County, Missouri	5. TYPE OF REPORT & PERIOD COVERED Final Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Consoer, Townsend and Associates, Ltd.	8. CONTRACT OR GRANT NUMBER(s) DACW43-79-C-0075
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101	12. REPORT DATE December 1979 13. NUMBER OF PAGES Approximately 70
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) National Dam Safety Program. B & K Lake Number 2 Dam (MO 11002), Mississippi - Kaskaskia - St. Louis Basin, Warren County, Missouri. Phase I Inspection Report.	15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRI Approved for release; distribution unlimited.	
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)	
18. SUPPLEMENTARY NOTES	
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dam Safety, Lake, Dam Inspection, Private Dams	
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.	

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: B & K Lake No. 2 Dam (Mo. 11002) Phase I Inspection Report

This report presents the results of field inspection and evaluation of the B & K Lake No. 2 Dam (Mo. 11002).

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

1) Spillway will not pass 50 percent of the Probable Maximum Flood
2) Overtopping could result in dam failure
3) Dam failure significantly increases the hazard to loss of life downstream

SUBMITTED BY: SIGNED — 17 DEC 1979
Chief, Engineering Division — Date

APPROVED BY: SIGNED — 17 DEC 1979
Colonel, CE, District Engineer — Date

B & K LAKE NO. 2 DAM
WARREN COUNTY, MISSOURI

MISSOURI INVENTORY NO. 11002

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY
CONSOER, TOWNSEND AND ASSOCIATES, LTD.
ST. LOUIS, MISSOURI
AND
ENGINEERING CONSULTANTS, INC.
ENGLEWOOD, COLORADO
A JOINT VENTURE

UNDER DIRECTION OF
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
FOR
GOVERNOR OF MISSOURI

DECEMBER 1979

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: B & K Lake No. 2 Dam, Missouri Inv. No. 11002
State Located: Missouri
County Located: Warren
Stream: An Unnamed Tributary of Lost Creek
Date of Inspection: August 20, 1979

Assessment of General Condition

B & K Lake No. 2 Dam was inspected using the "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed by the Chief of Engineers, U.S. Army, Washington, D.C., with the help of Federal and State agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

Based on the criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and apreciable property loss could occur in the event of failure of the dam. Within the estimated five mile damage zone downstream of the dam are one dam and reservoir, seven houses, six buildings, and one road crossing which may be subjected to flooding, with possible damage and/or destruction, and possible loss of life. B & K Lake No. 2 Dam is in the small size classification

since it is less than 40 feet high and impounds less than 1,000 acre-feet of water.

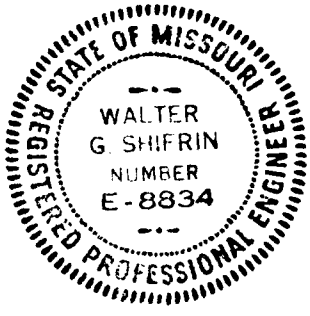
Our inspection and evaluation indicates that the spillway of B & K Lake No. 2 Dam does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. B &K Lake No. 2 Dam being a small size dam with a high hazard potential, is required by the guidelines to pass from one-half of the Probable Maximum Flood to the Probable Maximum Flood without overtopping. Since there is a high hazard potential downstream of the dam, the appropriate spillway design flood for this dam is the Probable Maximum Flood. It was determined that the reservoir/spillway system can accommodate 38 percent of the Probable Maximum Flood without overtopping the dam. Our evaluation also indicates that the reservoir/spillway system can accommodate the 100-year flood without overtopping.

The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in the region. The 100-year flood is defined as a flood having a one percent chance of being equalled or exceeded during any given year.

Other deficiencies noted by the inspection team were: the wave erosion on the upstream embankment slope; minor erosion and sloughing on the left abutment; erosion in the spillway discharge channel; lack of protection against surface erosion on some newly placed embankment material on the downstream slope adjacent to the spillway; a need for periodic inspection by a qualified engineer and a lack of maintenance schedule. The lack of seepage and stability analyses on record is also a deficiency that should be corrected.

It is recommended that the owner take action to correct or control the deficiencies described above.

Walter G. Shifrin, P.E.



Overview of B & K Lake No. 2 Dam

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

B & K LAKE NO. 2 DAM, I.D. No. 11002

TABLE OF CONTENTS

TABLE OF CONTENTS

(Continued)

TABLE OF CONTENTS

(Continued)

LIST OF PLATES

APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

B & K LAKE NO. 2 DAM, Missouri Inv. No. 11002

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The Dam Inspection Act, Public Law 92-367 of August, 1972, authorizes the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspections. Inspection for B & K Lake No. 2 Dam was carried out under Contract DACW 43-79-C-0075 between the Department of the Army, St. Louis District, Corps of Engineers, and the engineering firms of Consoer, Townsend & Associates, Ltd., and Engineering Consultants, Inc. (A Joint Venture), of St. Louis, Missouri.

b. Purpose of Inspection

The visual inspection of B & K Lake No. 2 Dam was made on August 20, 1979. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

This report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the field inspection; presents an assessment of hydrologic and hydraulic conditions at the site; presents an assessment as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

Subsurface investigations, laboratory testing, and detailed analyses were not within the scope of this study. The conclusions drawn herein, therefore, are based on the presence of, or absence of, obvious signs of distress. No warranty as to the absolute safety of the project features is implied by the conclusions presented in this report.

It should be noted that reference in this report to left or right abutments is as viewed looking downstream. Where left abutment or left side of the dam is used in this report, this also refers to southeast abutment or side, and right to the northwest abutment or side.

d. Evaluation Criteria

Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in the publication "Recommended Guidelines for Safety Inspection of Dams", Appendix D. These guidelines were developed with the help of several Federal agencies and many State agencies, professional engineering organizations, and private engineers.

1.2 Description of the Project

a. Description of Dam and Appurtenances

It should be noted that no design or as-built drawings are available for the dam or appurtenant structures. The following description is based exclusively on observations and measurements made during the visual inspection.

The dam is a compacted earthfill structure between earth abutments. The crest width is about 15 feet, and the crest length is approximately 298 feet. The maximum height of the embankment was measured as 32 feet. The crest elevation is approximately 856.5 feet above MSL.

The downstream slope of the embankment was measured to be 1V to 3H. The upstream slope from crest to reservoir level was measured to be 1V to 3H. No riprap was placed on the upstream face.

The spillway for B & K Lake No. 2 Dam is a cut into the right abutment. The spillway section is V-shaped. The control section has a total top width of 43 feet and is 1.5 feet deep. A 20 foot wide and 10 foot long concrete slab is provided on the control section of the spillway. The discharge channel for the spillway is an earthcut channel approximately 75 feet in length with approximately the same cross section as the spillway. A berm was constructed on the left side of the channel to channelize spillway dischrges away from the downstream slope of the dam.

A 6-inch diameter cast iron low level outlet pipe was provided for the dam. The pipe is controlled by a gate valve located 14 feet upstream from the downstream end of the pipe. The outlet is located 170 feet to the right of the left abutment.

b. Location

The dam is located at the headwaters of a small intermittent stream which is tributary to Lost Creek. The stream flows to the south about a quarter mile before entering Lost Creek.

Lost Creek flows southward from the confluence for about 2 miles and then southwesterly for about 11 miles where it flows into the Missouri River near the village of Gore just upstream of Mile 90. The upper reaches of Lost Creek are intermittent but, about 3 miles below the dam it becomes perennial.

The major access to the damsite from Warrenton, Missouri is west on the Interstate Highway No. 70 frontage road approximately 3 miles to a gravel road heading south, thence south on this road 1/4 mile to a private road to the west. The damsite is located at the end of the private road, approximately 1,400 feet from the beginning of the road. The dam and reservoir are shown in the Warrenton Quadrangle Sheet (7.5 minute series) in Section 24, Township 47 North, Range 3 West.

c. Size Classification

According to the "Recommended Guidelines for Safety Inspection of Dams", by the U.S. Department of the Army, Office of the Chief Engineer, the dam is classified in the dam size category as being "Small" since its storage is less than 1,000 acre-feet. The dam is also classified as "Small" in dam size category because its height is less than 40 feet. The overall size classification is, accordingly, "Small" in size.

d. Hazard Classification

The dam has been classified as having "High" hazard potential in the National Inventory of Dams, on the basis that in the event of failure of the dam or its appurtenances, excessive damage could occur to downstream property, together with the possibility of the loss of life. Our findings concur with the classification. Within the estimated five mile damage zone downstream of the dam are one reservoir and dam, seven dwellings, six buildings, and one road crossing.

e. Ownership

The dam and lake are privately owned by B & K Construction Company. The mailing address is B & K Construction Company, c/o Ken Davis Sr., 4140 Cypress Road, St. Ann, Missouri, 63114.

f. Purpose of Dam

The purpose of the dam is to impound water for recreational use as a private lake.

g. Design and Construction History

According to the owner, Mr. Ken Davis Sr., the dam was built in 1963 (est.) by Gene Rugh of Wright City, Missouri. Efforts to contact the original builder were futile and it is very doubtful if any design was performed prior to construction. According to the caretaker, Mr. Bob Curtis, an area of seepage was noticed a few years ago near the left abutment contact. This area was excavated and filled with a grouting compound and a surface layer of clay.

h. Normal Operational Procedures

B & K Lake No. 2 Dam is used to impound water for recreational use and normal procedure is to allow the lake level below the spillway crest to remain as high as rainfall, runoff and evaporation will allow.

1.3 Pertinent Data

a. Drainage Area (square miles): 0.039

b. Discharge at Damsite

Estimated experienced maximum flood (cfs):	NA
Estimated ungated spillway capacity with reservoir at top of dam elevation (cfs):	102

c. Elevation (Feet above MSL)

Top of dam:	856.5
Spillway crest:	855.0
Normal Pool:	855.0
Maximum Pool (PMF):	857.02

d. Reservoir

Length of pool at top of dam elevation (Feet):	600

e. Storage (Acre-Feet)

Top of dam:	47
Spillway crest:	39
Normal Pool:	39
Maximum Pool (PMF):	49

f. Reservoir Surface (Acres)

Top of dam:	5.1
Spillway crest:	4.7
Normal Pool:	4.7
Maximum Pool (PMF):	5.1+

g. Dam

Type:	Earthfill
Length:	298 feet
Structural Height:	32 feet

Hydraulic Height:	32 feet
Top width:	15 feet
Side slopes:	
Downstream	1V to 3H
Upstream	1V to 3H (From crest to water surface)
Zoning:	Unknown
Impervious core:	Unknown
Cutoff:	Unknown
Grout curtain:	Unknown

h. Diversion and Regulating Tunnel None

i. Spillway

Type:	V-shaped open channel, uncontrolled
Length of weir:	V-shaped channel, top width = 43 feet (at top of dam elevation)
Crest Elevation (feet above MSL):	855.0

j. Regulating Outlets

Type:	6-inch cast iron pipe
Length:	Unknown
Closure:	Gate Valve
Maximum Capacity:	Unknown

SECTION 2 : ENGINEERING DATA

2.1 Design

Design drawings or calculations are not available for the dam. It is doubtful if any plans exist for this dam.

2.2 Construction

No construction records or data are available for the dam and appurtenant structures.

2.3 Operation

No operational data are available for the dam.

2.4 Evaluation

a. Availability

No design drawings, design computations, construction data, or operation data are available.

In addition, no pertinent data were available for review of hydrology, spillway capacity, flood routing through the reservoir, outlet capacity, slope stability, seepage analysis, or foundation conditions.

b. Adequacy

The lack of engineering data did not allow for a definitive review and evaluation. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing and evaluating design, operation and construction data, but is based primarily on visual inspection, past performance history, and sound engineering judgment.

Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity

No valid engineering data are available.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

A visual inspection of the B & K Lake No. 2 Dam was made on August 20, 1979. The following persons were present during the inspection:

Name	Affiliation	Disciplines
Dr. M.A. Samad	Engineering Consultants, Inc.	Project Engineer, Hydraulics and Hydrology
Mark R. Haynes	Engineering Consultants, Inc.	Civil, Structural and Mechanical
David J. Kerkes	Engineering Consultants, Inc.	Soils
Dawn L. Jacoby	Engineering Consultants, Inc.	Soils
Peter L. Strauss	Engineering Consultants, Inc.	Geology
Kevin Blume	Consoer, Townsend & Assoc., Ltd.	Civil and Structural

Specific observations are discussed below.

b. Dam

The dam crest was protected against surface erosion by an adequate grass cover. Small shrinkage cracks were visible on the surface. No significant deviations in horizontal or vertical alignment were apparent. A 1-inch wide settlement crack was observed along the contact of the crest with the left abutment. There was no evidence of the dam ever being overtopped.

The upstream slope has no riprap protection and has consequently undergone minor erosion from wave action. Exposed material is a clayey silt. Small shrinkage cracks are visible on the top section of the slope. No depressions or bulges were apparent. No evidence of rodent activity was observed on the embankment slope.

The downstream slope has a heavy grass cover which appears to be adequately protecting the slope from surface erosion. An area on the slope adjacent to the spillway appears to have had new material placed on it. No bulges or depressions were observed. No cracks or signs of instability were apparent. There was no evidence of seepage on the downstream slope or along the toe. The reservoir for B & K Lake No. 1 Dam which is below B & K Lake No. 2 Dam is approximately 2 foot below the toe of the dam.

The Soil Conservation Service reports (Soil Survey of Montgomery and Warren Counties, Missouri, 1978) that the soils in the bottom land at the damsite are clayey silt (ML) and cherty, clayey gravel (GC). The upslope soils consist largely of silty clay (CL-ML) and clay (CL).

The abutments slope upward from crest. The left abutment has had new material placed along the contact with downstream slope. This new material does not have adequate protection and is eroding. Due to this erosion problem, there is minor evidence of slope instability of the toe at the left abutment. The spillway is located in the right abutment. Some minor erosion was observed on the right abutment contact. Some new material has been placed near the right abutment contact on the downstream slope. There is no evidence of slope instability in the right abutment.

c. Project Geology

The damsite is situated on the border between the Dissected Till Plain Section of Central Lowlands Physiographic Province which extends to the north and the Ozark Plateau Province to the south (Fenneman, N.M., Physiography of Eastern United States, 1946). Although the area in which the dam and reservoir are located was glaciated during Pleistocene time, the till and loess which characterize the uplands of the Till Plains have been largely removed by erosion since the end of the Pleistocene. The area is characterized by wooded hills which have gentle to steep slopes.

The bedrock geology of the area, as shown on the Geologic Map of Missouri (1979), typically consists of gently northeastwardly dipping (ca. 30 - 50 feet/mile) sediments of Paleozoic age. North of Warren County these beds are often capped by young (Pleistocene) deposits of glacial drift and wind blown loess. In the southern areas of the county the bedrocks are generally covered by residual soil, colluvium, or alluvium. The rocks underlying the area are predominately carbonates (limestones and dolomites) although beds of sandstone and shale are not infrequent.

The bedrock of Warren County contains some minor folding. The largest known geologic structure in the area is a gentle anticline centered about 2-1/2 miles northwesterly of the town of Warrenton. This structure trends nearly north-south and is about 2-1/2 miles long. It is not known if this fold affects the attitude of the beds beneath the site.

d. Appurtenant Structures

(1) Spillway

The spillway appeared to be in good condition. No evidence of instability or erosion of the side slopes was observed. The concrete slab in the spillway appeared to be stable and no cracking or spalling of the concrete was observed. No trashrack was provided for the spillway.

The discharge channel for the spillway is an earth cut channel approximately 75 feet in length with approximately the same cross section as the spillway. A berm was constructed on the left side of the channel to channelize any discharge through the spillway away from the downstream slope of the dam. No evidence of instability in the channel was observed. No erosion was observed. The channel is partially covered with grass and is partially lined with gravel. The channel does not appear to be adequately protected against surface erosion from discharge through the spillway and surface runoff.

Neither the spillway nor the discharge channel were obstructed.

(2) Outlet Works

The only regulated outlet works for the B & K Lake No. 2 Dam is a 6-inch cast iron low level drain pipe. The discharge through the pipe is controlled by a gate valve located 14 feet upstream from the downstream end of the pipe. The valve was located in a steel drum housing and is accessible. The valve was operated by the inspection team and the system functioned properly. The invert of the outlet of the pipe was at approximately the same elevation as the normal water surface of the reservoir just downstream. The intake of the pipe was inaccessible. No seepage through or around the pipe was observed.

e. Reservoir Area

The water surface elevation was approximately 854.5 feet above MSL on the day of the inspection.

The reservoir rim is gently sloped and no indi - tion of instability or severe erosion was observed. The slopes above the reservoir are heavily wooded. A few houses are built around the reservoir rim.

f. Downstream Channel

The downstream channel of the spillway is a well defined, grass-lined channel cut into the right abutment downstream of the dam. The channel is unobstructed and meanders. The channel has an eroded section approximately 3 feet wide and 2 feet deep. The side slopes of both sides of the channel above the eroded section is approximately 1V to 3H. The channel has been eroded due to discharges through the

channel. The channel is approximately 200 feet long and flows into a downstream reservoir. The channel is at an approximate 90 degree angle to the discharge channel of the spillway.

The outlet pipe discharges directly into a downstream reservoir.

3.2 Evaluation

The visual inspection did not reveal any items which are sufficiently significant to indicate a need for immediate remedial action.

The following conditions were observed which could affect the safety of the dam or which will require maintenance within a reasonable period of time.

1. Minor wave erosion on the upstream slope.

2. Lack of protection against erosion on the newly placed material on the downstream slope adjacent to the spillway.

3. Minor erosion and sloughing of the slope on the left abutment.

4. Inadequate protection of the slopes of the discharge channel.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

There are no specific procedures which are followed for the operation of this dam. The water level below the spillway crest is allowed to remain as high as possible.

4.2 Maintenance of Dam

The dam is maintained by the owner, Mr. Ken Davis, and his caretaker for the property, Mr. Bob Curtis who resides near the damsite. The dam seems to be maintained satisfactorily.

The downstream and upstream slopes, along with the crest, are kept free of saplings and brush. Periodically, the grasses on the dam are mowed.

4.3 Maintenance of Operating Facilities

The only operable facility at the damsite is a 6-inch gate valve located at the downstream toe which is in operable condition and is also maintained by the caretaker, Mr. Bob Curtis.

4.4 Description of Any Warning System in Effect

The inspection team is not aware of any existing warning system in effect.

4.5 Evaluation

The operation and maintenance for this dam seems to be adequate, however, the corrective measures listed in Section 7 should be undertaken within a reasonable period of time.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

The watershed area of B & K Lake No. 2 Dam upstream from the dam axis consists of approximately 25 acres. Most of the watershed area is wooded and covered with grass. Land gradients in the watershed average roughly 7 percent. B & K Lake No. 2 Dam is located on an unnamed tributary of Lost Creek. The reservoir is about 1/2 mile upstream from the confluence of the unnamed tributary and Lost Creek. At its longest arm the watershed is approximately 1/4 mile long. A drainage map showing the watershed area is presented as Plate 1 in Appendix B.

Evaluation of the hydraulic and hydrologic features of B & K Lake No. 2 Dam was based on criteria set forth in the Corps of Engineers' "Recommended Guidelines for Safety Inspection of Dams", and additional guidance provided by the St. Louis District of the Corps of Engineers. The Probable Maximum Flood (PMF) was calculated from the Probable Maximum Precipitation (PMP) using the methods outlined in the U.S. Weather Bureau Publication, Hydrometeorological Report No. 33. The probable maximum storm duration was set at 24 hours, and storm rainfall distribution was based on criteria given in the Corps of Engineers' EM 1110-2-1411 (Standard Project Storm). The Soil Conservation Service (SCS) method was used for deriving the unit hydrograph, utilizing the Corps of Engineers' computer program HEC-1 (Dam Safety Version). The

parameters of the unit hydrograph are presented in Appendix B. The SCS method was used for determining the loss rate. The hydrologic soil group of the watershed was determined by use of published soil maps. The hydrologic soil group of the watershed and the SCS curve number are also presented in Appendix B. The curve number, the unit hydrograph parameters, and the PMP rainfall were directly input to the HEC-1 (Dam Safety Version) computer program to obtain the PMF hydrogrpah. The computed peak discharges of the PMF and one-half of the PMF at the B & K Lake No. 2 Dam were routed through B & K Lake No. 2 Dam reservoir by the Modified Puls Method also utilizing the HEC-1 (Dam Safety Version) computer program. The peak discharges for the PMF and one-half of the PMF at B & K Lake No. 2 Dam are 647 cfs and 324 cfs, respectively.

Both the PMF and one-half of the PMF inflow hydrographs at the B & K Lake No. 2 Dam were routed through B & K Lake No. 2 Dam reservoir by the Modified Puls Method, also utilizing the HEC-1 (Dam Safety Version) computer program. The peak outflow discharges for the PMF and one-half of the PMF at B & K Lake No. 2 Dam are 520 cfs and 193 cfs, respectively. Both the PMF and one-half of the PMF when routed through the reservoir resulted in overtopping of B & K Lake No. 2 Dam.

The size of physical features utilized to develop the stage-outflow relation for the spillway and overtop of the dam were determined from field notes, and sketches, prepared during the field inspection. The reservoir stage-capacity data were based on the U.S.G.S. Warrenton Quadrangle topographic map (7.5 minute series). The spillway and dam overtop rating curve and the reservoir capacity curve for B & K Lake No. 2 Dam are presented as Plates 2 and 3 in Appendix B.

From the standpoint of dam safety, the hydrologic design of a dam must aim at avoiding overtopping. Overtopping is especially dangerous for an earth dam because of its erosive characteristics. The safe hydrologic design of a dam requires a spillway discharge capability in combination with an embankment crest height that can handle a very large and exceedingly rare flood without overtopping.

The Corps of Engineers design dams to safely pass the Probable Maximum Flood that is estimated could be generated from the dam's watershed. This is the generally accepted criterion for major dams throughout the world, and is the standard for dam safety where overtopping would pose any threat to human life. According to the Corps' criteria, the hydrologic requirement for safety for this dam is the capability to pass from one-half of the Probable Maximum Flood to the Probable Maximum Flood without overtopping.

b. Experience Data

It is believed that no records of reservoir stage or spillway discharge are maintained for this site.

c. Visual Observations

Observations made of the spillway during the visual inspection are discussed in Section 3.1c(1) and evaluated in Section 3.2.

d. Overtopping Potential

As indicated in Section 5.1.a, both the Probable Maximum Flood and one-half of the Probable Maximum Flood, when routed through the reservoir, resulted in overtopping of the dam. The peak outflow discharges for the PMF and one-half of the PMF at B & K Lake No. 2 Dam are 520 cfs and 193 cfs, respectively. The PMF overtopped the dam crest by 0.52 feet and one-half of the PMF overtopped the dam crest by 0.14 feet. The total duration of embankment overflow is 0.83 hour during the PMF, and 0.33 hour during one-half of the PMF. The spillways and the reservoir of B & K Lake No. 2 Dam are capable of accommodating a flood equal to approximately 38 percent of the PMF before overtopping the dam.

The computed one percent chance flood using the 100-year 24 hour rainfall data was routed through the reservoir. The routing results indicate that the spillway/reservoir system will accommodate the 100-year flood without overtopping the dam.

The failure of the dam could cause extensive damage to the property downstream of the dam and possible loss of life. Within the estimated five mile damage zone downstream of the dam are one dam and reservoir (Mo. 30506), seven houses, six buildings and one road crossing.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

There were no signs of settlement or distress observed on the embankment during the visual inspection. Minor wave erosion was observed on the upstream slope of the embankment. Some erosion and sloughing were also observed on the downstream left abutment. These conditions do not appear to be serious at this time, but they should be monitored and the slopes stabilized as required. In the absence of seepage and stability analyses, no quantitive evaluation of the structural stability could be made.

No evidence of structural instability in the spillway control section, discharge channel, or outlet works was observed. The discharge channel, however, was not adequately protected against erosion which could affect the structural stability of the channel.

b. Design and Construction Data

No design computations were uncovered during the report preparation phase. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available. No embankment or foundation soil parameters are available for carrying out a conventional stability analysis on the embankment. No construction data or specifications relating to the degree of

embankment compaction are available for use in a stability analysis.

c. Operating Records

No operating records are available relating to the stability of the dam or appurtenant structures. The water level on the day of the inspection was about 6 inches below the crest of the spillway, and it is assumed that the reservoir remains close to full at all times. The low level drain is operable.

d. Post Construction Changes

According to the caretaker of the dam, Mr. Bob Curtis, an area of seepage was noticed a few years ago near the left abutment contact. This area was excavated and filled with a grouting compound and a surface layer of clay. Recently some new material has been placed on the downstream slope adjacent to the spillway.

e. Seismic Stability

The dam is located in Seismic Zone 1, as defined in "Recommended Guidelines for Safety Inspection of Dams" as prepared by the Corps of Engineers. A well designed and constructed earth dam should not be significantly affected by an earthquake to be expected in Seismic Zone 1.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation, however, the investigation is intended to identify any need for such studies.

It should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is also important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be assurance that an unsafe condition could be detected.

a. Safety

The spillway capacity of B & K Lake No. 2 Dam was found to be "Seriously Inadequate". The spillway/reservoir system will accommodate only 38 percent of the PMF before overtopping the dam. The soils in the area are quite silty. The dam is overtopped by more than 1/2 feet during the PMF. The duration of overflow is about an hour. If the body of the dam is made up of silty soils, the dam would be susceptible to

erosion and failure during overtopping.

No quantitative evaluation of the stability of the embankment can be made in view of the absence of seepage and stability analyses. The present embankment and appurtenant structures, however, appeared to have performed satisfactorily since their construction without failure or evidence of major instability.

The wave erosion on the upstream slope of the embankment, and minor erosion and sloughing on the left abutment do not appear to be affecting the safety of the dam at this time, but the conditions should be monitored and repairs made as required.

b. Adequacy of Information

The conclusions presented in this report are based on field measurements, past performance and present condition of the dam. Information on the design hydrology, hydraulic design, and the operation and maintenance of the dam were not available. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Urgency

The remedial measures recommended in Paragraph 7.2 should be accomplished in the near future. The items recommended in Paragraph 7.2a should be pursued on a high priority basis.

d. Necessity for Phase II Inspection

Based on the results of the Phase I inspection, and if the remedial measures recommended in Paragraph 7.2 are undertaken, a Phase II inspection is not felt to be necessary.

7.2 Remedial Measures

a. Alternatives:

Spillway capacity and/or height of dam should be increased to accommodate the PMF without overtopping the dam.

b. O & M Procedures:

1. Provide adequate protection against surface erosion in the spillway discharge channel and on the newly placed material on the downstream slope adjacent to the spillway.

2. Monitor the wave erosion on the upstream slope and make repairs as required.

3. Monitor the erosion and sloughing observed on the left abutment and stabilize the slopes as required.

4. Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of dams.

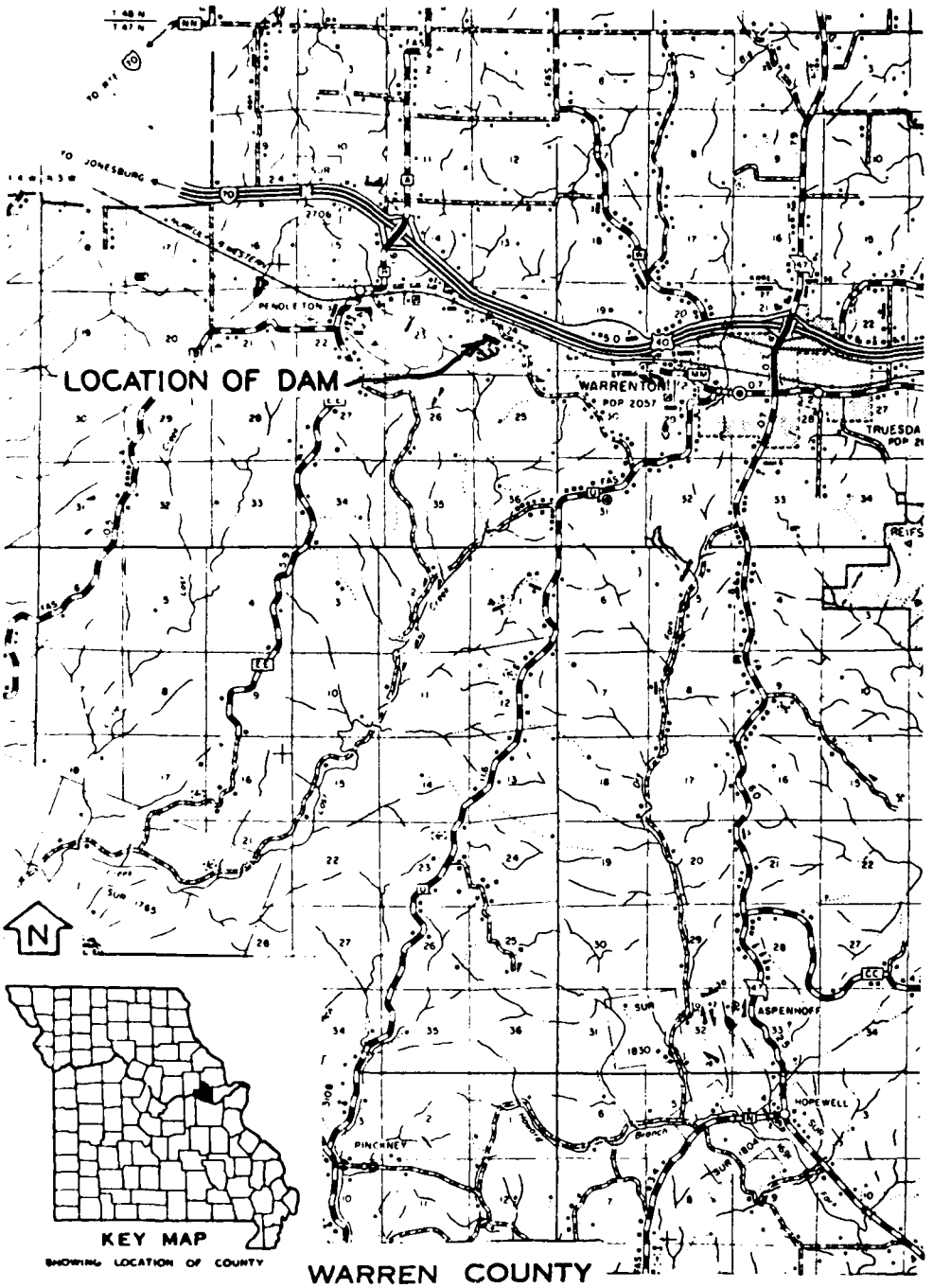
5. The owner should initiate the following programs:

(a) Periodic inspection of the dam by a professional engineer experienced in the design and construction of earthen dams.

(b) Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.

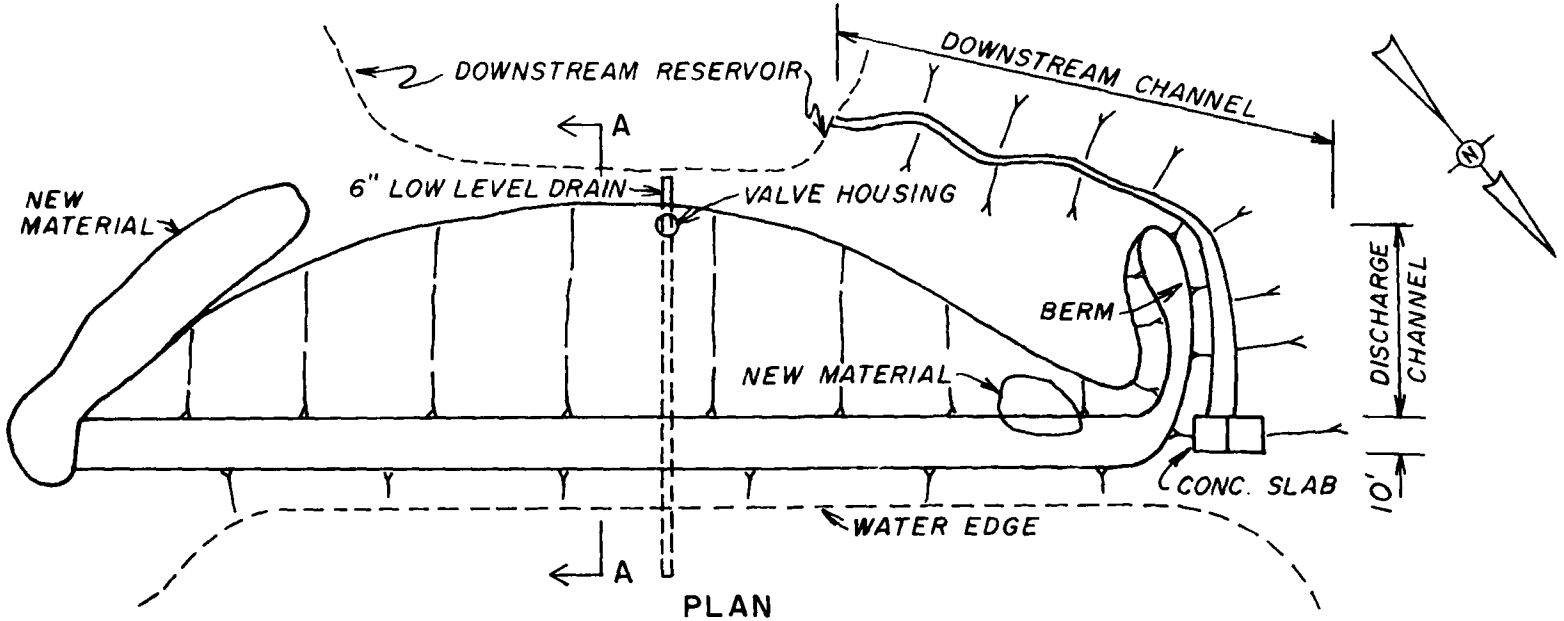
PLATES

PLATE-1

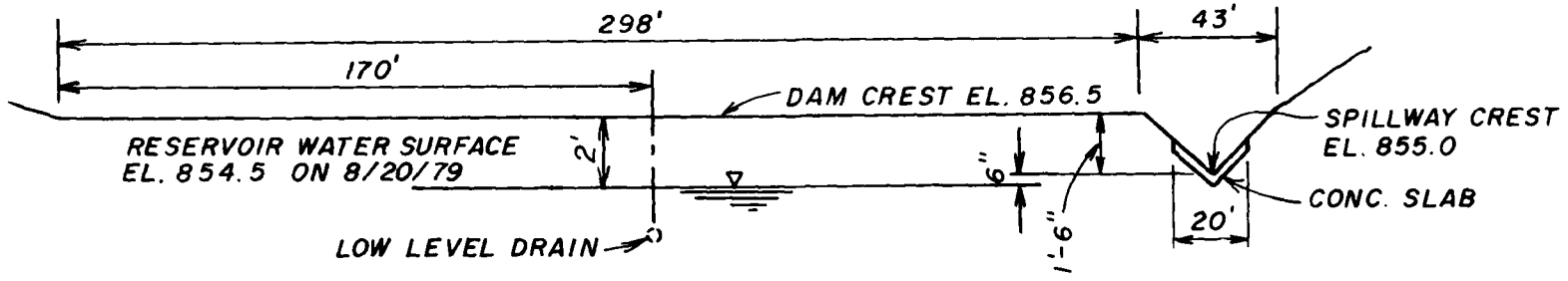


LOCATION MAP - B & K LAKE NO. 2 DAM

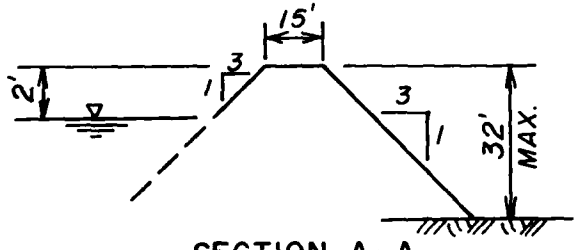
B & K LAKE NO. 2 DAM (MO. 11002)
PLAN, ELEVATION & SECTION



PLAN



ELEVATION

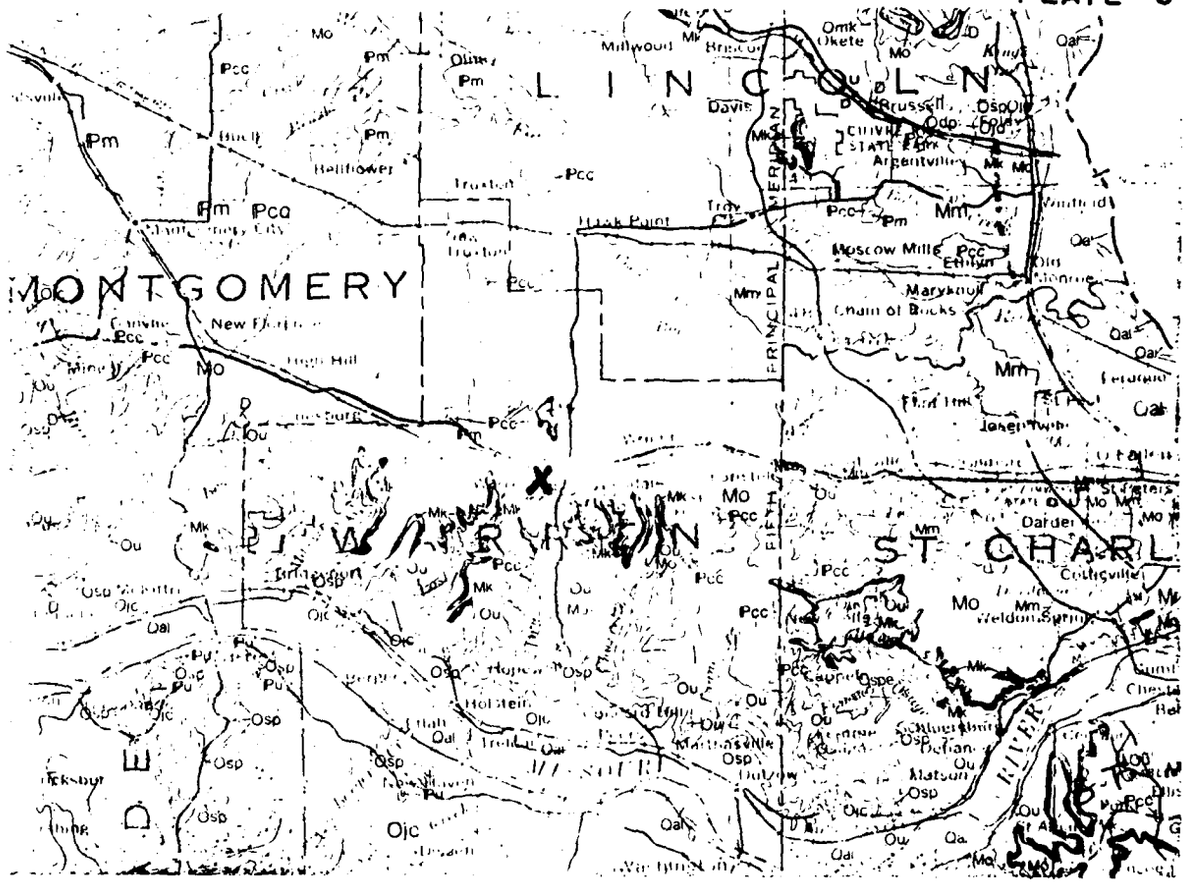


SECTION A-A
NOT TO SCALE

SCALE
1" = 50' (HORIZONTAL)
VERTICAL (NOT TO SCALE)

PLATE 2

PLATE 3

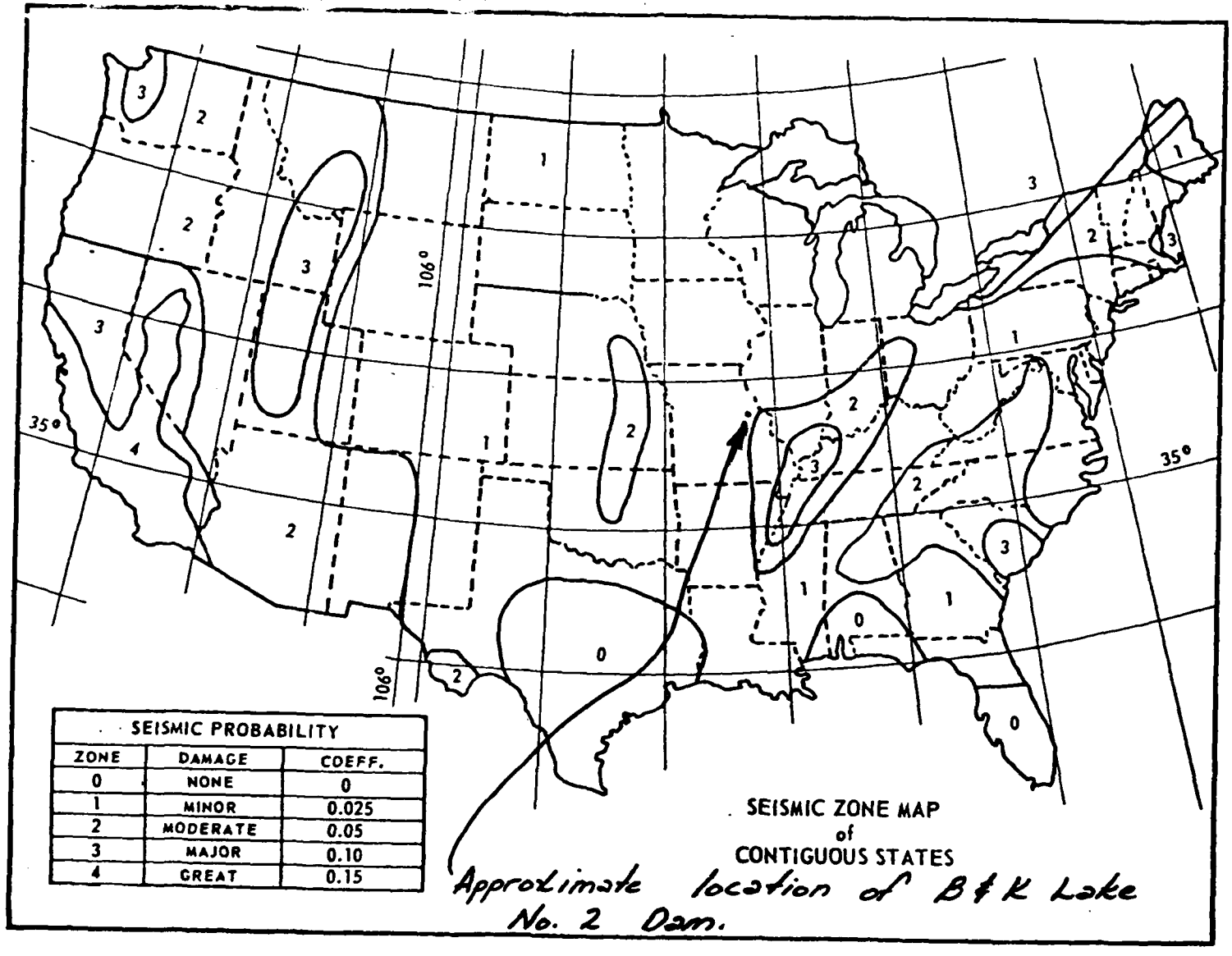


PENNSYLVANIAN	{Pm	MARMATON GROUP
	{Pcc	CHEROKEE GROUP, CABANISS SUBGROUP
MISSISSIPPIAN	{Mo	OSAGEAN SERIES
	{Mk	KINDERHOOKIAN SERIES
ORDOVICIAN	Ou	CINCINNATION SERIES AND CHAMPLANIAN SERIES

X – LOCATION OF DAM, MO. 11002

REFERENCE:
GEOLOGIC MAP OF MISSOURI
MISSOURI GEOLOGIC SURVEY
1979

GEOLOGIC MAP OF WARREN COUNTY AND ADJACENT AREA



SEISMIC PROBABILITY		
ZONE	DAMAGE	COEFF.
0	NONE	0
1	MINOR	0.025
2	MODERATE	0.05
3	MAJOR	0.10
4	GREAT	0.15

SEISMIC ZONE MAP
of
CONTIGUOUS STATES

Approximate location of B & K Lake No. 2 Dam.

PLATE 4

APPENDIX A

PHOTOGRAPHS TAKEN DURING INSPECTION

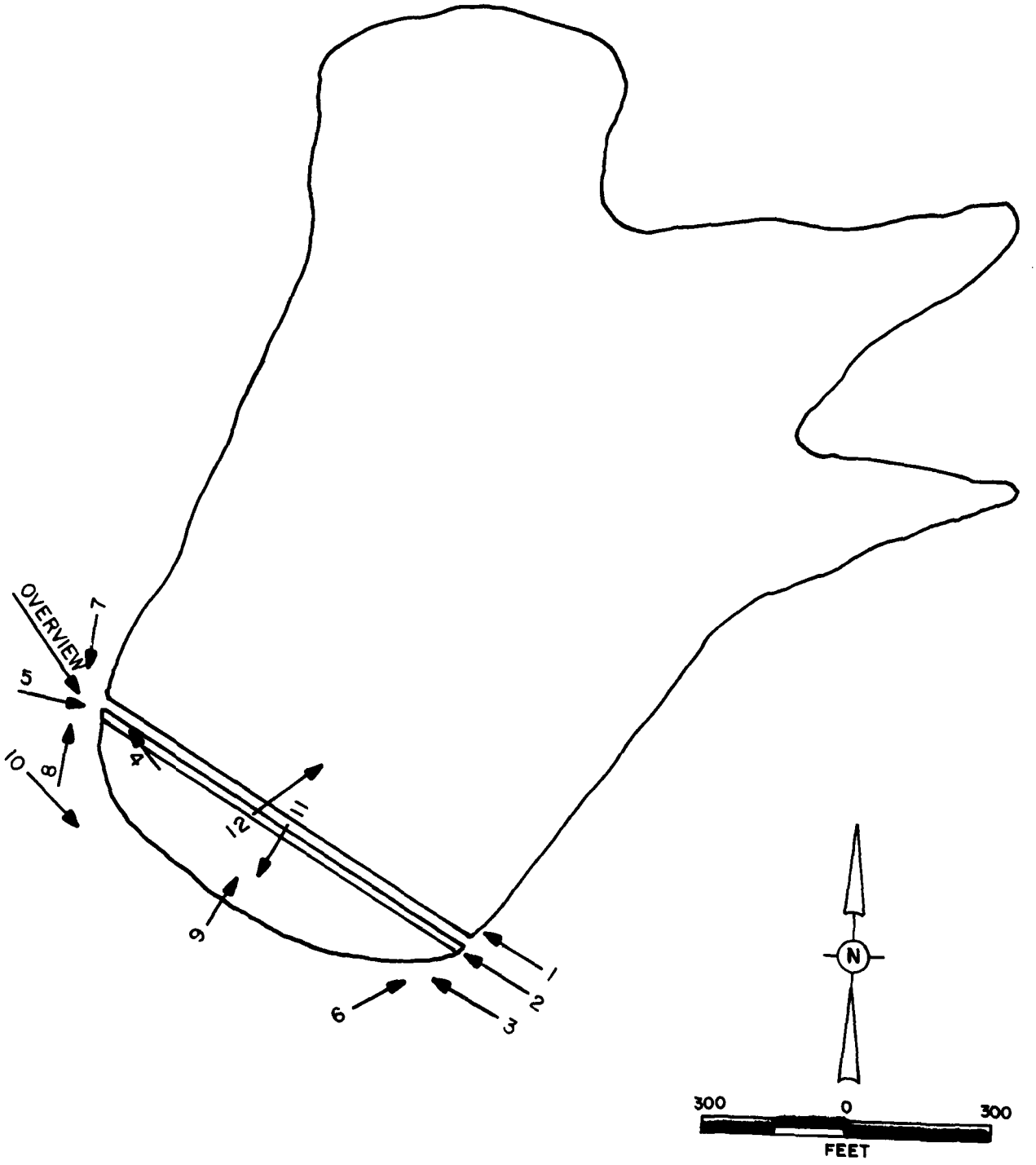


PHOTO INDEX
FOR
B & K LAKE NO. 2 DAM

B & K Lake No. 2 Dam

Photo 1. - View of the upstream embankment slope.

Photo 2. - View of the crest.

Photo 3. - View of the downstream embankment slope.

Photo 4. - View of the shrinkage cracks on the crest.

Photo 5. - View looking toward the left abutment from the spillway showing location of new material on the right abutment and the channelizing berm of the spillway.

Photo 6. - View of erosion on left abutment contact from downstream.

Photo 7. - View of the spillway from upstream.

Photo 8. - View of the discharge channel from downstream.

Photo 9. - View of the control valve for the low level drain.

Photo 10. - View of the downstream channel from the end of the discharge channel.

Photo 11. - View looking downstream of the dam.

Photo 12. - View of the reservoir rim.

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

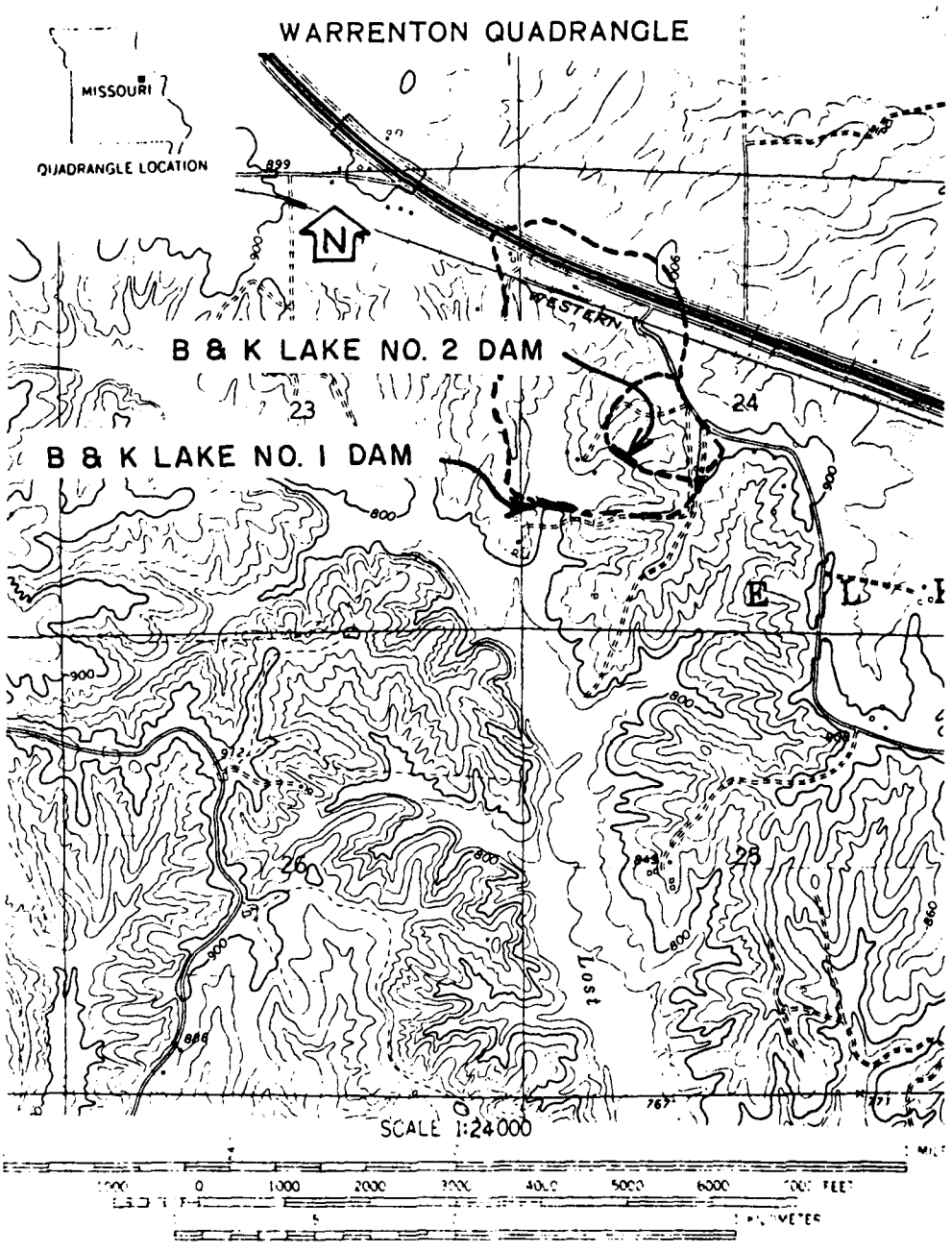
Photo 11

Photo 12

APPENDIX B

HYDROLOGIC COMPUTATIONS

PLATE 1, APPENDIX B



B & K LAKE NO.2DAM (MO. 11002)
DRAINAGE BASIN

DAM SAFETY INSPECTION - MISSOURI

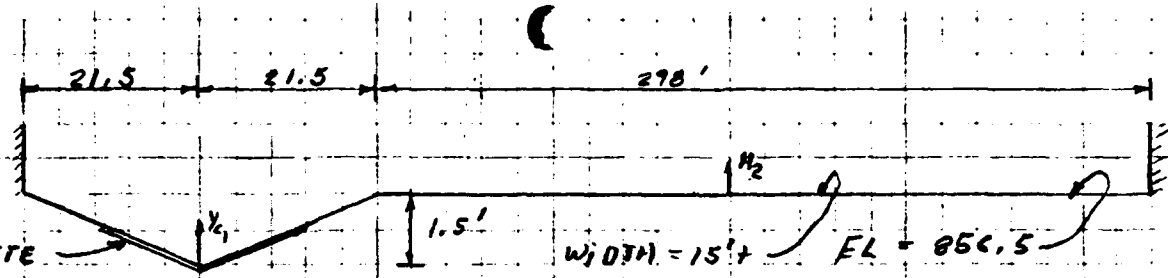
B & K Lake No. 2 Dam

ELDER GINCY SPILLWAY AND OVERTOP RATING CURVE

BY MLB DATE 5-21-

SHEET NO. 1 OF

JOB NO. 2410-001

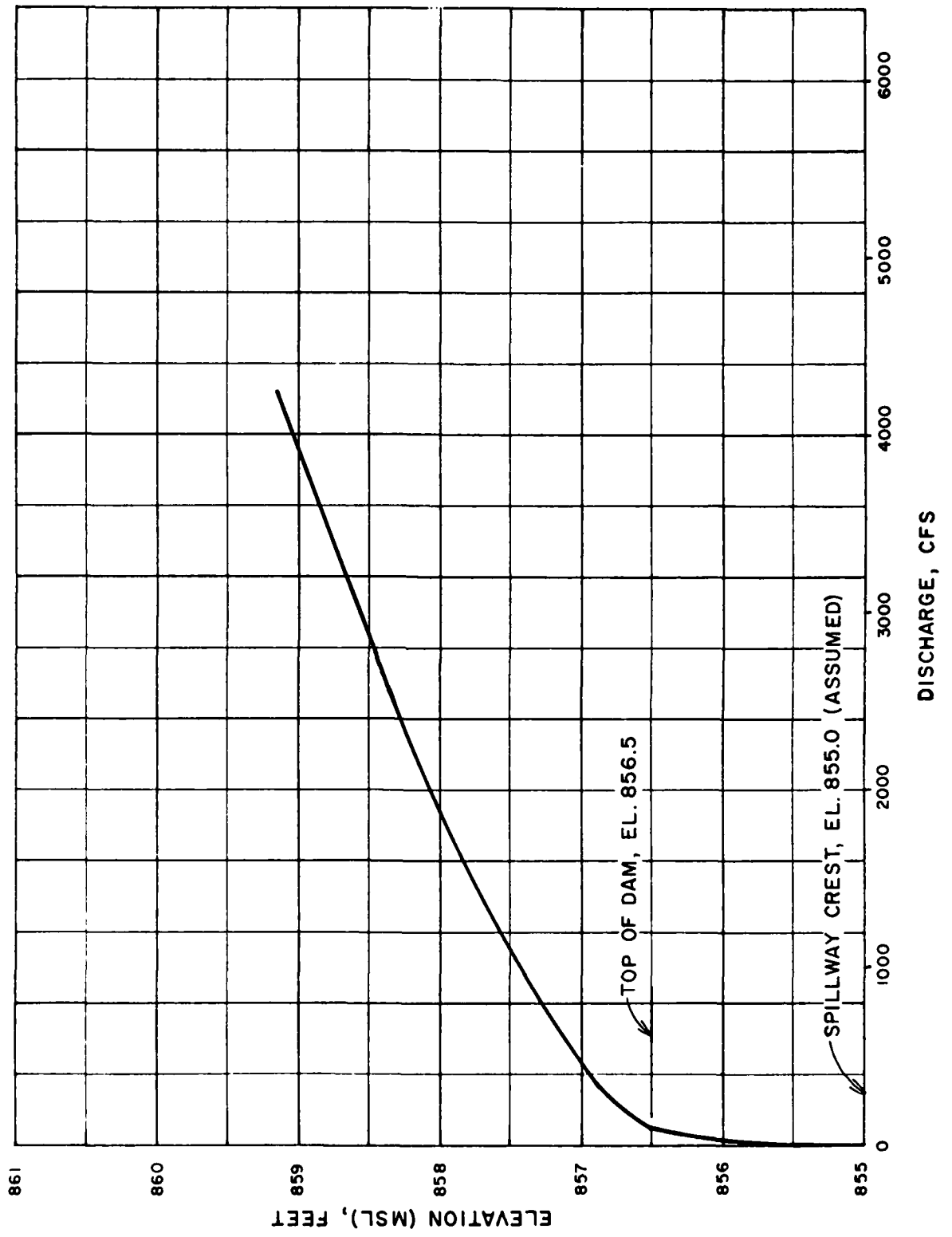


EL = 855 (ASSUMED)

CRITICAL DEPTH ASSUMED IN SPILLWAY SECTION.

Y_{c_1} (FT)	A_{c_1} (FT^2)	T_{c_1} (FT)	$V_{c_1} = 5.67\sqrt{\frac{A_{c_1}}{T_{c_1}}}$	$\frac{V_{c_1}^2}{2g}$	$Q_{c_1} = A_{c_1} \cdot V_{c_1}$ (CFS)	U/S W.S. $= 855 + \frac{V_{c_1}^2}{2g} + Y_{c_1}$	H_2	C_2	L_2	$Q_2 = C_2 L_2 H_2^{3/2}$	$Q_T = Q_{c_1} + Q_2$
0	0	0	0	0	0	855	–	–	–	–	0
.5	3.58	14.33	2.84	0.12	10.17	855.62	–	–	–	–	10.17
1	14.33	28.67	4.01	0.25	57.46	856.25	–	–	–	–	57.46
1.5	32.25	43.0	4.91	0.37	158.35	856.87	.37	2.70	298	181.09	339.44
2.0	53.75	43.0	6.34	0.62	340.78	857.62	1.12	2.64	298	932.5	1273.28
2.5	75.25	43.0	7.50	0.87	564.38	858.37	1.87	2.63	298	2004.1	2568.55
3.0	96.75	43.0	8.51	1.12	823.34	859.12	2.62	2.63	298	3323.7	4147.06
3.5	118.25	43.0	9.40	1.37	1111.5	859.87	3.37	2.63	298	4848.6	5960.16
4.0	139.75	43.0	10.22	1.62	1428.25	860.62	4.12	2.63	298	6554.2	7982.42

PLATE 2, APPENDIX B



B & K LAKE NO. 2 DAM
SPILLWAY & OVERTOP RATING CURVE

ENGINEERING CONSULTANTS, INC.

Dam Safety Inspection - Missouri SHEET NO. 1 OF

B&K Lake No. 2 Dam JOB NO. 1240

RESERVOIR AREA CAPACITY BY M.R.H. DATE 6-1-79

B&K Lake No. 2 Dam

RESERVOIR AREA CAPACITY

Elev. M.S.L. (Ft.)	Reservoir Surface Area (Acres)	Incremental Volume (Ac.-ft.)	Total Volume (Ac.-ft.)	Remarks
830	0	0	0	Est. Streambed Elev. at Dam.
855	4.7	39.2	39.2	W.S. as shown on U.S.G.S. map (Elev. Assumed)
856.5	5.1	7.3	46.5	Top of Dam
860	6.1	19.6	66.1	Area as measured on U.S.G.S. map.
880	13.4	190.3	266.4	Area as measured on U.S.G.S. map.

DAM NO MO 11002

DETERMINATION OF PMP

1. Determine drainage area of the basin

   D.A. = 25 Ac = 0.039 Sq. mi

2. Determine PMP Index Rainfall

   Location of centroid of basin:

   Long. = 91°12'10", Lat. = 38°49'19". ⇒ PMP = 24" (From HMR #33, F(2.1))

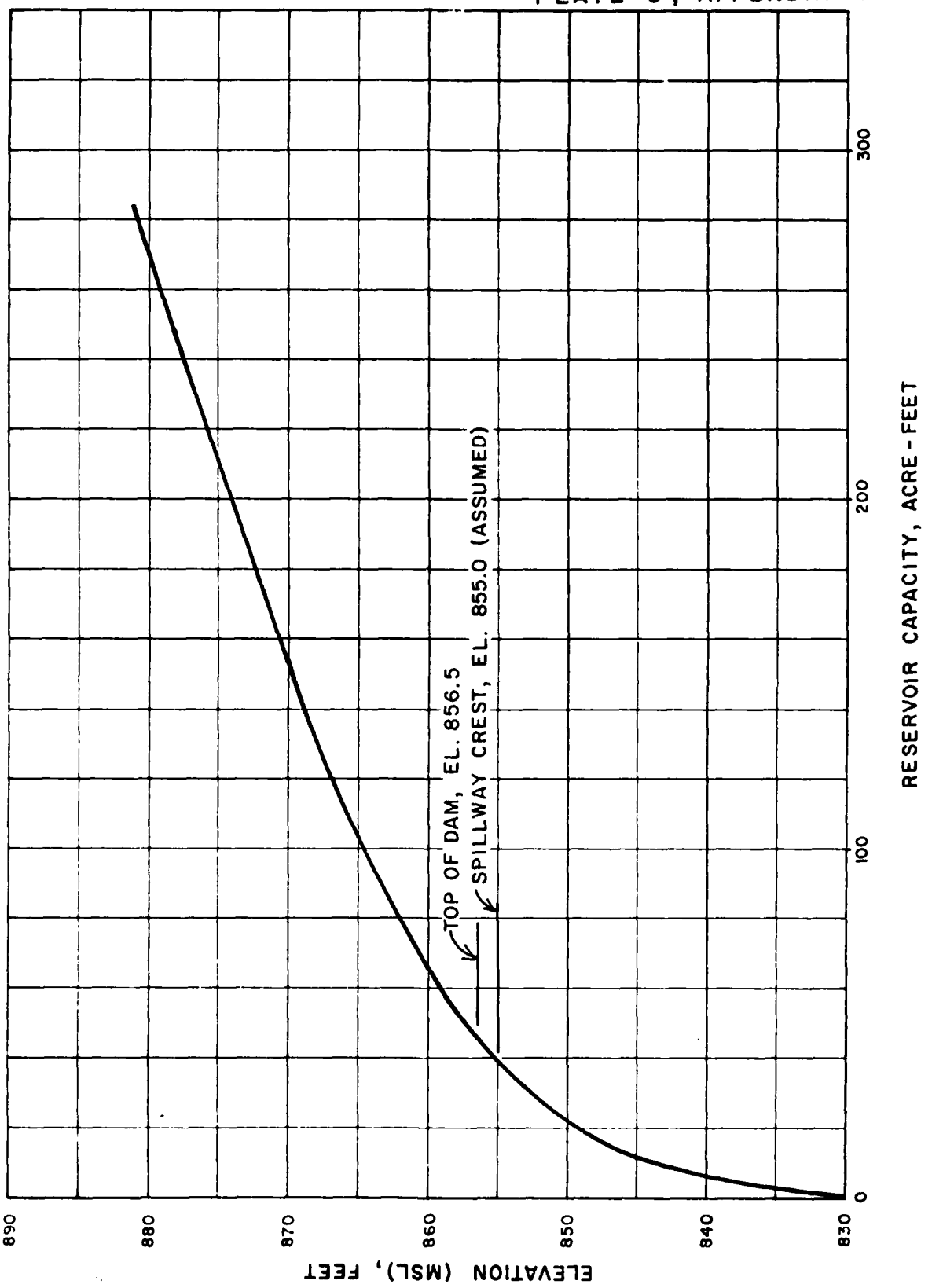
3. Determine basin rainfall interms of percentage of PMP Index Rainfall for various durations:

   Location: Long. = 91°12'10", Lat. = 38°49'19".

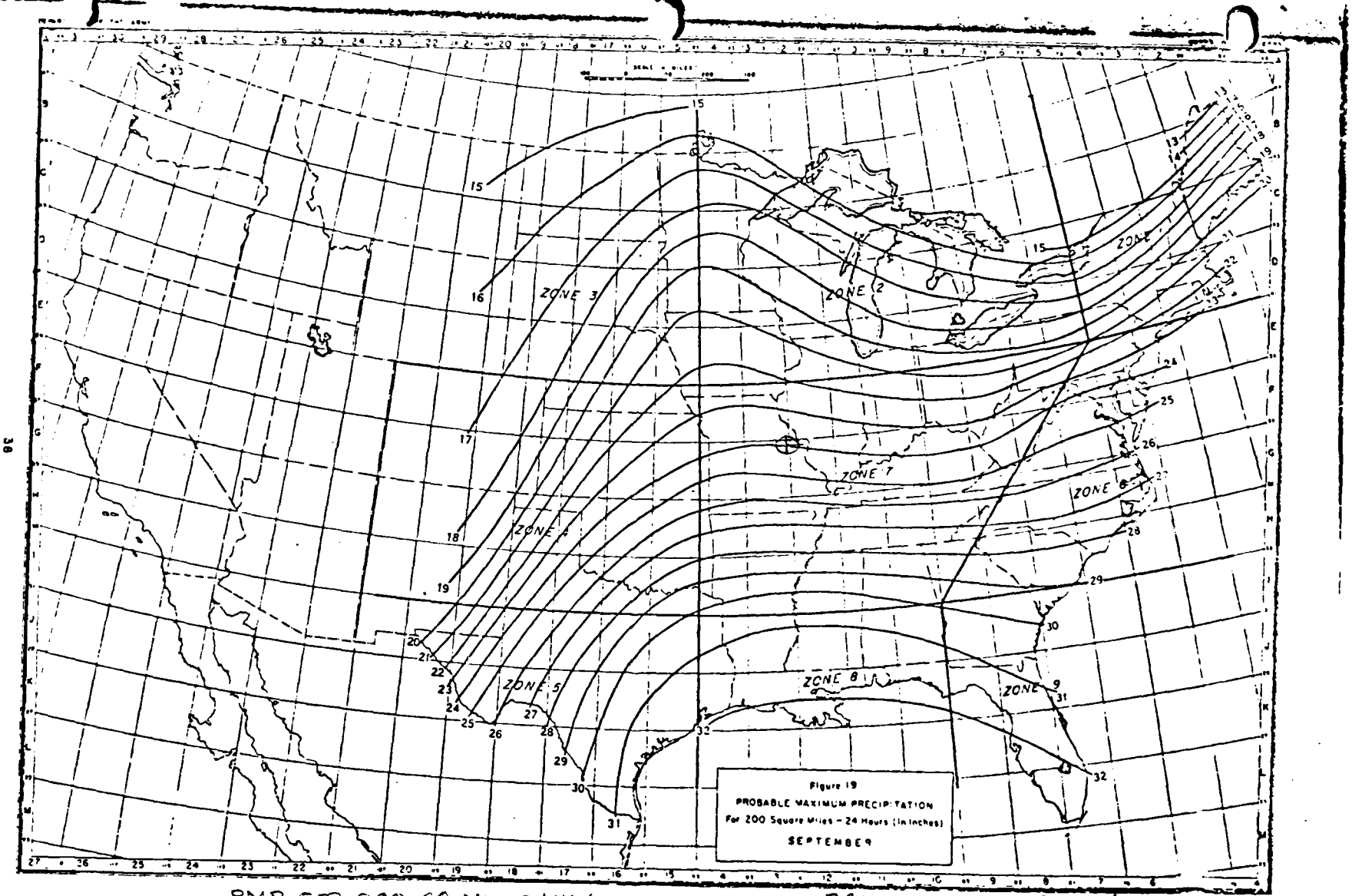
   ⇒ Zone 7

Duration (Hrs.)	Percent of Index Rainfall (%)	Total Rainfall (inches)	Rainfall Increments (inches)	Duration of Increment (Hrs.)
6	100	24	24	6
12	120	28.8	4.8	6
24	130	31.2	2.4	12

PLATE 3, APPENDIX B



B & K LAKE NO. 2 DAM
RESERVOIR CAPACITY CURVE



B-8

PMP FOR 200 SQ. MI. - 24HRS
DURATION = 21"

B&K Lake No. 2 Dam (MO. 11002)
[illegible] WATERSHED
LAT. = 38° 49' 19"; LONG. = 91° 2' 10"

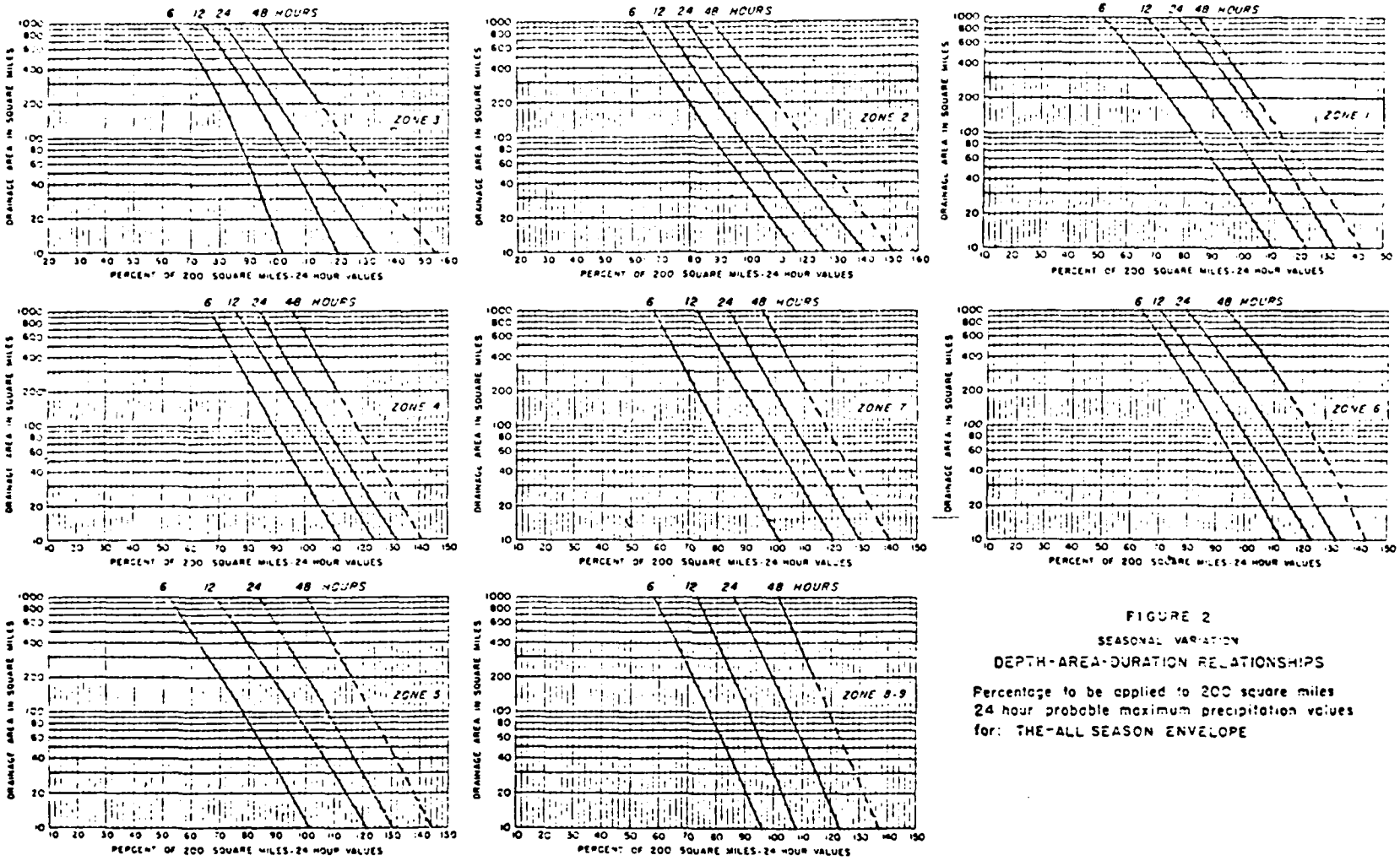


FIGURE 2

SEASONAL VARIATION

DEPTH-AREA-DURATION RELATIONSHIPS

Percentage to be applied to 200 square miles 24 hour probable maximum precipitation values for: THE-ALL SEASON ENVELOPE

B&K Lake No. 2 Dam — SHEET NO. 1 OF — JOB NO. 12-40-001 — BY MAS DATE 6-78

1. Drainage Area = 25 acres = 0.039 Sq. mi.
2. Length of stream = (0.35 x 2100' / 5280' / mi) = 0.13 miles
3. Elevation at drainage divide along the longest stream, H_1 = 905'
4. Reservoir elevation at spillway crest H_2 = 855'
5. Difference in elevation, ΔH = 905 - 855 = 50'
6. Average slope of stream = $\frac{\Delta H}{L} = \frac{50}{700} = 7.14\%$
7. Time of Concentration
   a) By Kirpich formula:
   $$T_c = \left(\frac{11.9 \times L^3}{\Delta H}\right)^{0.385} = \left(\frac{11.9 \times .13^3}{50}\right)^{0.385}$$
   $$= 0.06 \text{ hour}$$
   b) By velocity estimate:
   Avg. Slope = 7.14% ⇒ Avg. velocity ≈ 5 ft/sec
   $$T_c = \frac{700}{5 \times 3600} = 0.04 \text{ hr.}$$
   Use T_c = 0.083 hr to meet the Corps criteria of Minimum D = 5 minutes
8. Lag time, $L_1 = 0.6 \times 0.083 = 0.05$ hr.
9. Unit duration: Use Minimum D = 5 minutes to meet the Corps criteria
10. Time to peak $T_p = \frac{D}{2} + L_1 = \frac{0.083}{2} + 0.05 = 0.092$ hr.
11. $q_p = \frac{484A}{T_p} = \frac{484 \times .039}{0.092} = 205$ cfs

B&K Lake No. 2 Dam

DETERMINATION OF HYDROLOGIC SOIL GROUP & SCS CURVE NUMBER

B&K LAKE NO. 2 DAM

DETERMINATION OF HYDROLOGIC SOIL GROUP & SCS CURVE NUMBER

1. The Soils in the watershed consist of C & D group soils but D group soil is predominant.

   Assume 'D' group soil for this sub-watershed.

2. Most of the watershed area is wooded and covered with grass. Assume 'Fair' condition for infiltration.

   Thus CN = 79 for soil group D & AMC-II

   ⇒ CN = 91 for AMC-III.

HEC1DB INPUT DATA

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

     1                A
     2                A                          DAM SAFETY INSPECTION - MISSOURI
     3                A                            B AR LAKE NO. 2 DAM (11002 )
     4                A                  PMF AND 50 PERCENT PMF DETERMINATION ***  11002
     5                B     300       0       1       0       0       0       0       0       0       0
     6                PI      5
     7                J       1       2       1
     8                J1    1.0     0.5
     9                K       0   11002                                           1
    10                K1  INPUT PRECIPITATION INDEX, RATIOS AND UNIT HYDROGRAPH PARAMETERS
    11                M       1       2   0.029               0.039     1.0
    12                P              24.0     100     120     130
    13                T                                                   -1      -01
    14                J2            0.01
    15                K       0       2       1
    16                K       1   11002                                   1
    17                K1  ROUTE HYDROGRAPH THROUGH B & K LAKE DAM ( 11002 )
    18                Y                                       1       1
    19                Y1      1                                               -855.0      -1
    20                Y*855.00  855.62  856.25  856.59  856.97  857.62  858.37  859.12  859.87  860.62
    21                Y5      0.      10.     57.     100.    339.    1273.   2569.   4147.   5960.   7982.
    22                R5      0.    39.2    46.5    56.1    266.4
    23                R1    850.    855.   856.5    850.    860.
    24                R3  855.0
    25                RD  856.5
                      K     49
```

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT 11002
ROUTE HYDROGRAPH TO 11002
END OF NETWORK

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
AM SAFETY VERSION      JULY 1978
LAST MODIFICATION  26 FEB 79
**********

RUN  DATE= 79/10/03.
     TIME= 07.17.41.
```

DAM SAFETY INSPECTION - MISSOURI
S & K LAKE NO. 2 DAM (11002)
PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	5	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1

RTIOS= 1.00 .50

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT PRECIPITATION INDEX, RATIOS AND UNIT HYDROGRAPH PARAMETERS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
11002	3	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.04	0.00	.04	1.00	.6000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.00	100.00	120.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-91.00	0.00	0.00

CURVE NO = -91.00 WETNESS = -1.00 EFFECT CN = 91.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .05

RECESSION DATA
STRTQ= 9.00 QRCSN= 0.00 RTIOR= 1.00

TIME INCREMENT TOO LARGE--(NHQ IS GT LAG/2)

UNIT HYDROGRAPH 5 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .05 VOL= 1.00

202. 77. 18. 4. 1.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.01	0.00	.01	0.	1.01	12.35	151	.20	.20	.00	59.
1.01	.10	2	.01	0.00	.01	0.	1.01	12.40	152	.20	.20	.00	59.
1.01	.15	3	.01	0.00	.01	0.	1.01	12.45	153	.20	.20	.00	59.
1.01	.20	4	.01	0.00	.01	0.	1.01	12.50	154	.20	.20	.00	60.
1.01	.25	5	.01	0.00	.01	0.	1.01	12.55	155	.20	.20	.00	60.
1.01	.30	6	.01	0.00	.01	0.	1.01	13.00	156	.20	.20	.00	60.
1.01	.35	7	.01	0.00	.01	0.	1.01	13.05	157	.24	.24	.00	68.
1.01	.40	8	.01	0.00	.01	0.	1.01	13.10	158	.24	.24	.00	71.
1.01	.45	9	.01	0.00	.01	0.	1.01	13.15	159	.24	.24	.00	71.
1.01	.50	10	.01	0.00	.01	0.	1.01	13.20	160	.24	.24	.00	72.
1.01	.55	11	.01	0.00	.01	0.	1.01	13.25	161	.24	.24	.00	72.
1.01	1.00	12	.01	0.00	.01	0.	1.01	13.30	162	.24	.24	.00	72.
1.01	1.05	13	.01	0.00	.01	0.	1.01	13.35	163	.24	.24	.00	72.
1.01	1.10	14	.01	0.00	.01	0.	1.01	13.40	164	.24	.24	.00	72.
1.01	1.15	15	.01	.00	.01	0.	1.01	13.45	165	.24	.24	.00	72.
1.01	1.20	16	.01	.00	.01	0.	1.01	13.50	166	.24	.24	.00	72.
1.01	1.25	17	.01	.00	.01	0.	1.01	13.55	167	.24	.24	.00	72.
1.01	1.30	18	.01	.00	.01	0.	1.01	14.00	168	.24	.24	.00	72.
1.01	1.35	19	.01	.00	.01	0.	1.01	14.05	169	.30	.30	.00	84.
1.01	1.40	20	.01	.00	.01	0.	1.01	14.10	170	.30	.30	.00	89.
1.01	1.45	21	.01	.00	.01	1.	1.01	14.15	171	.30	.30	.00	90.
1.01	1.50	22	.01	.00	.01	1.	1.01	14.20	172	.30	.30	.00	90.
1.01	1.55	23	.01	.00	.01	1.	1.01	14.25	173	.30	.30	.00	90.
1.01	2.00	24	.01	.00	.01	1.	1.01	14.30	174	.30	.30	.00	90.
1.01	2.05	25	.01	.00	.01	1.	1.01	14.35	175	.30	.30	.00	90.
1.01	2.10	26	.01	.00	.01	1.	1.01	14.40	176	.30	.30	.00	90.
1.01	2.15	27	.01	.00	.01	1.	1.01	14.45	177	.30	.30	.00	90.
1.01	2.20	28	.01	.00	.01	1.	1.01	14.50	178	.30	.30	.00	90.
1.01	2.25	29	.01	.00	.01	1.	1.01	14.55	179	.30	.30	.00	90.
1.01	2.30	30	.01	.00	.01	1.	1.01	15.00	180	.30	.30	.00	90.
1.01	2.35	31	.01	.00	.01	1.	1.01	15.05	181	.18	.18	.00	67.
1.01	2.40	32	.01	.00	.01	1.	1.01	15.10	182	.36	.36	.00	94.
1.01	2.45	33	.01	.00	.01	1.	1.01	15.15	183	.36	.36	.00	106.
1.01	2.50	34	.01	.00	.01	1.	1.01	15.20	184	.55	.55	.00	146.
1.01	2.55	35	.01	.01	.01	1.	1.01	15.25	185	.64	.64	.00	179.
1.01	3.00	36	.01	.01	.01	2.	1.01	15.30	186	1.55	1.55	.00	375.
1.01	3.05	37	.01	.01	.01	2.	1.01	15.35	187	2.55	2.55	.01	647.
1.01	3.10	38	.01	.01	.01	2.	1.01	15.40	188	1.00	1.00	.00	429.
1.01	3.15	39	.01	.01	.01	2.	1.01	15.45	189	.64	.64	.00	258.
1.01	3.20	40	.01	.01	.01	2.	1.01	15.50	190	.55	.55	.00	189.
1.01	3.25	41	.01	.01	.01	2.	1.01	15.55	191	.36	.36	.00	133.
1.01	3.30	42	.01	.01	.01	2.	1.01	16.00	192	.36	.36	.00	115.
1.01	3.35	43	.01	.01	.01	2.	1.01	16.05	193	.28	.28	.00	94.
1.01	3.40	44	.01	.01	.01	2.	1.01	16.10	194	.28	.28	.00	86.
1.01	3.45	45	.01	.01	.01	2.	1.01	16.15	195	.28	.28	.00	85.
1.01	3.50	46	.01	.01	.01	2.	1.01	16.20	196	.28	.28	.00	84.
1.01	3.55	47	.01	.01	.01	2.	1.01	16.25	197	.28	.28	.00	84.
1.01	4.00	48	.01	.01	.01	2.	1.01	16.30	198	.28	.28	.00	84.
1.01	4.05	49	.01	.01	.01	2.	1.01	16.35	199	.28	.28	.00	84.
1.01	4.10	50	.01	.01	.01	2.	1.01	16.40	200	.28	.28	.00	84.
1.01	4.15	51	.01	.01	.01	2.	1.01	16.45	201	.28	.28	.00	84.
1.01	4.20	52	.01	.01	.01	2.	1.01	16.50	202	.28	.28	.00	84.
1.01	4.25	53	.01	.01	.01	2.	1.01	16.55	203	.28	.28	.00	84.
1.01	4.30	54	.01	.01	.01	2.	1.01	17.00	204	.26	.26	.00	84.
1.01	4.35	55	.01	.01	.01	2.	1.01	17.05	205	.22	.22	.00	72.

1.01	4.40	56	.01	.01	.01	2.	1.01	17.10	206	.02	.02	.00	68.
1.01	4.45	57	.01	.01	.01	2.	1.01	17.15	207	.02	.02	.00	67.
1.01	4.50	58	.01	.01	.01	2.	1.01	17.20	208	.02	.02	.00	66.
1.01	4.55	59	.01	.01	.01	2.	1.01	17.25	209	.02	.02	.00	66.
1.01	5.00	60	.01	.01	.01	2.	1.01	17.	210	.02	.02	.00	66.
1.01	5.05	61	.01	.01	.01	2.	1.01	17.3	211	.02	.02	.00	66.
1.01	5.10	62	.01	.01	.01	2.	1.01	17.40	212	.02	.02	.00	66.
1.01	5.15	63	.01	.01	.00	3.	1.01	17.45	213	.02	.02	.00	66.
1.01	5.20	64	.01	.01	.00	3.	1.01	17.50	214	.02	.02	.00	66.
1.01	5.25	65	.01	.01	.00	3.	1.01	17.55	215	.02	.02	.00	66.
1.01	5.30	66	.01	.01	.00	3.	1.01	18.00	216	.02	.02	.00	66.
1.01	5.35	67	.01	.01	.00	3.	1.01	18.05	217	.02	.02	.00	26.
1.01	5.40	68	.01	.01	.00	3.	1.01	18.10	218	.02	.02	.00	11.
1.01	5.45	69	.01	.01	.00	3.	1.01	18.15	219	.02	.02	.00	7.
1.01	5.50	70	.01	.01	.00	3.	1.01	18.20	220	.02	.02	.00	6.
1.01	5.55	71	.01	.01	.00	3.	1.01	18.25	221	.02	.02	.00	6.
1.01	6.00	72	.01	.01	.00	3.	1.01	18.30	222	.02	.02	.00	6.
1.01	6.05	73	.07	.05	.02	10.	1.01	18.35	223	.02	.02	.00	6.
1.01	6.10	74	.07	.05	.02	13.	1.01	18.40	224	.02	.02	.00	6.
1.01	6.15	75	.07	.05	.02	14.	1.01	18.45	225	.02	.02	.00	6.
1.01	6.20	76	.07	.05	.02	15.	1.01	18.50	226	.02	.02	.00	6.
1.01	6.25	77	.07	.05	.02	15.	1.01	18.55	227	.02	.02	.00	6.
1.01	6.30	78	.07	.05	.01	16.	1.01	19.00	228	.02	.02	.00	6.
1.01	6.35	79	.07	.05	.01	16.	1.01	19.05	229	.02	.02	.00	6.
1.01	6.40	80	.07	.05	.01	16.	1.01	19.10	230	.02	.02	.00	6.
1.01	6.45	81	.07	.05	.01	16.	1.01	19.15	231	.02	.02	.00	6.
1.01	6.50	82	.07	.05	.01	17.	1.01	19.20	232	.02	.02	.00	6.
1.01	6.55	83	.07	.06	.01	17.	1.01	19.25	233	.02	.02	.00	6.
1.01	7.00	84	.07	.06	.01	17.	1.01	19.30	234	.02	.02	.00	6.
1.01	7.05	85	.07	.06	.01	17.	1.01	19.35	235	.02	.02	.00	6.
1.01	7.10	86	.07	.06	.01	17.	1.01	19.40	236	.02	.02	.00	6.
1.01	7.15	87	.07	.06	.01	17.	1.01	19.45	237	.02	.02	.00	6.
1.01	7.20	88	.07	.06	.01	18.	1.01	19.50	238	.02	.02	.00	6.
1.01	7.25	89	.07	.06	.01	18.	1.01	19.55	239	.02	.02	.00	6.
1.01	7.30	90	.07	.06	.01	18.	1.01	20.00	240	.02	.02	.00	6.
1.01	7.35	91	.07	.06	.01	18.	1.01	20.05	241	.02	.02	.00	6.
1.01	7.40	92	.07	.06	.01	18.	1.01	20.10	242	.02	.02	.00	6.
1.01	7.45	93	.07	.06	.01	18.	1.01	20.15	243	.02	.02	.00	6.
1.01	7.50	94	.07	.06	.01	18.	1.01	20.20	244	.02	.02	.00	6.
1.01	7.55	95	.07	.06	.01	18.	1.01	20.25	245	.02	.02	.00	6.
1.01	8.00	96	.07	.06	.01	18.	1.01	20.30	246	.02	.02	.00	6.
1.01	8.05	97	.07	.06	.01	18.	1.01	20.35	247	.02	.02	.00	6.
1.01	8.10	98	.07	.06	.01	19.	1.01	20.40	248	.02	.02	.00	6.
1.01	8.15	99	.07	.06	.01	19.	1.01	20.45	249	.02	.02	.00	6.
1.01	8.20	100	.07	.06	.01	19.	1.01	20.50	250	.02	.02	.00	6.
1.01	8.25	101	.07	.06	.00	19.	1.01	20.55	251	.02	.02	.00	6.
1.01	8.30	102	.07	.06	.00	19.	1.01	21.00	252	.02	.02	.00	6.
1.01	8.35	103	.07	.06	.00	19.	1.01	21.05	253	.02	.02	.00	6.
1.01	8.40	104	.07	.06	.00	19.	1.01	21.10	254	.02	.02	.00	6.
1.01	8.45	105	.07	.06	.00	19.	1.01	21.15	255	.02	.02	.00	6.
1.01	8.50	106	.07	.06	.00	19.	1.01	21.20	256	.02	.02	.00	6.
1.01	8.55	107	.07	.06	.00	19.	1.01	21.25	257	.02	.02	.00	6.
1.01	9.00	108	.07	.06	.00	19.	1.01	21.30	258	.02	.02	.00	6.
1.01	9.05	109	.07	.06	.00	19.	1.01	21.35	259	.02	.02	.00	6.
1.01	9.10	110	.07	.06	.00	19.	1.01	21.40	260	.02	.02	.00	6.
1.01	9.15	111	.07	.06	.00	19.	1.01	21.45	261	.02	.02	.00	6.
1.01	9.20	112	.07	.06	.00	19.	1.01	21.50	262	.02	.02	.00	6.
1.01	9.25	113	.07	.06	.00	19.	1.01	21.55	263	.02	.02	.00	6.
1.01	9.30	114	.07	.06	.00	19.	1.01	22.00	264	.02	.02	.00	6.
1.01	9.35	115	.07	.06	.00	19.	1.01	22.05	265	.02	.02	.00	6.

1.01	9.40	116	.07	.06	.00	19.	1.01	22.10	266	.02	.02	.00	6.
1.01	9.45	117	.07	.06	.00	19.	1.01	22.15	267	.02	.02	.00	6.
1.01	9.50	118	.07	.06	.00	19.	1.01	22.20	268	.02	.02	.00	6.
1.01	9.55	119	.07	.06	.00	19.	1.01	22.25	269	.02	.02	.00	6.
1.01	10.00	120	.07	.06	.00	19.	1.01	22.30	270	.02	.02	.00	6.
1.01	10.05	121	.07	.06	.00	19.	1.01	22.35	271	.02	.02	.00	6.
1.01	10.10	122	.07	.06	.00	19.	1.01	22.40	272	.02	.02	.00	6.
1.01	10.15	123	.07	.06	.00	19.	1.01	22.45	273	.02	.02	.00	6.
1.01	10.20	124	.07	.06	.00	19.	1.01	22.50	274	.02	.02	.00	6.
1.01	10.25	125	.07	.06	.00	19.	1.01	22.55	275	.02	.02	.00	6.
1.01	10.30	126	.07	.06	.00	19.	1.01	23.00	276	.02	.02	.00	6.
1.01	10.35	127	.07	.06	.00	19.	1.01	23.05	277	.02	.02	.00	6.
1.01	10.40	128	.07	.06	.00	19.	1.01	23.10	278	.02	.02	.00	6.
1.01	10.45	129	.07	.06	.00	19.	1.01	23.15	279	.02	.02	.00	6.
1.01	10.50	130	.07	.06	.00	19.	1.01	23.20	280	.02	.02	.00	6.
1.01	10.55	131	.07	.06	.00	20.	1.01	23.25	281	.02	.02	.00	6.
1.01	11.00	132	.07	.06	.00	20.	1.01	23.30	282	.02	.02	.00	6.
1.01	11.05	133	.07	.06	.00	20.	1.01	23.35	283	.02	.02	.00	6.
1.01	11.10	134	.07	.06	.00	20.	1.01	23.40	284	.02	.02	.00	6.
1.01	11.15	135	.07	.06	.00	20.	1.01	23.45	285	.02	.02	.00	6.
1.01	11.20	136	.07	.06	.00	20.	1.01	23.50	286	.02	.02	.00	6.
1.01	11.25	137	.07	.06	.00	20.	1.01	23.55	287	.02	.02	.00	6.
1.01	11.30	138	.07	.06	.00	20.	1.02	0.00	288	.02	.02	.00	6.
1.01	11.35	139	.07	.06	.00	20.	1.02	.05	289	0.00	0.00	0.00	0.
1.01	11.40	140	.07	.06	.00	20.	1.02	.10	290	0.00	0.00	0.00	0.
1.01	11.45	141	.07	.07	.00	20.	1.02	.15	291	0.00	0.00	0.00	0.
1.01	11.50	142	.07	.07	.00	20.	1.02	.20	292	0.00	0.00	0.00	0.
1.01	11.55	143	.07	.07	.00	20.	1.02	.25	293	0.00	0.00	0.00	0.
1.01	12.00	144	.07	.07	.00	20.	1.02	.30	294	0.00	0.00	0.00	0.
1.01	12.05	145	.20	.20	.00	46.	1.02	.35	295	0.00	0.00	0.00	0.
1.01	12.10	146	.20	.20	.00	56.	1.02	.40	296	0.00	0.00	0.00	0.
1.01	12.15	147	.20	.20	.00	59.	1.02	.45	297	0.00	0.00	0.00	0.
1.01	12.20	148	.20	.20	.00	59.	1.02	.50	298	0.00	0.00	0.00	0.
1.01	12.25	149	.20	.20	.00	59.	1.02	.55	299	0.00	0.00	0.00	0.
1.01	12.30	150	.20	.20	.00	59.	1.02	1.00	300	0.00	0.00	0.00	0.
									SUM	31.20	30.04	1.16	9062.
										(792.)(	763.)(	29.)(	256.61)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	647.	100.	31.	30.	9089.
CMS	18.	3.	1.	1.	257.
INCHES		23.78	30.04	30.04	30.04
MM		604.10	763.11	763.11	763.11
AC-FT		49.	62.	62.	62.
THOUS CU M		61.	77.	77.	77.

HYDROGRAPH AT STA 11002 FOR PLAN 1, RTIO 1

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	10.	13.	14.	15.	15.	16.	16.	16.
16.	17.	17.	17.	17.	17.	17.	18.	18.	18.
18.	18.	18.	18.	18.	18.	18.	18.	19.	19.

19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	19.	19.	19.
20.	20.	20.	20.	20.	20.	20.	20.	20.	20.
20.	20.	20.	20.	46.	56.	59.	59.	59.	59.
59.	59.	59.	60.	60.	60.	70.	71.	71.	72.
72.	72.	72.	72.	72.	72.	72.	72.	84.	89.
90.	90.	90.	90.	90.	90.	90.	90.	90.	90.
97.	94.	106.	146.	179.	273.	647.	429.	258.	189.
133.	115.	94.	90.	85.	84.	84.	84.	84.	84.
84.	84.	84.	84.	72.	68.	67.	66.	66.	66.
66.	66.	66.	66.	66.	66.	28.	11.	7.	6.
6.	6.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.	6.	2.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	447.	108.	41.	30.	906.
CMS	13.	3.	1.	1.	257.
INCHES		23.75	30.04	30.04	30.04
MM		604.10	763.11	763.11	763.11
AC-FT		49.	62.	62.	62.
THOUS CU M		61.	77.	77.	77.

HYDROGRAPH AT STA 11000 FOR PLAN 1, RTIO 2

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	5.	7.	7.	7.	8.	8.	8.	8.
8.	8.	8.	8.	9.	9.	9.	9.	9.	9.
9.	9.	9.	9.	9.	9.	9.	9.	9.	9.
9.	9.	9.	9.	9.	9.	9.	9.	9.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
10.	10.	10.	10.	23.	26.	29.	30.	30.	30.
30.	30.	30.	30.	30.	30.	34.	35.	36.	36.
36.	36.	36.	36.	36.	36.	36.	36.	42.	44.
45.	45.	45.	45.	45.	45.	45.	45.	45.	45.
55.	47.	55.	73.	69.	140.	324.	215.	129.	95.
57.	57.	47.	43.	42.	42.	42.	42.	42.	42.
42.	42.	42.	42.	36.	34.	33.	33.	33.	33.
33.	33.	33.	33.	33.	33.	13.	5.	4.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.

3.	3.	3.	3.	3.	3.	3.	3.	1.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	324.	50.	16.	15.	4535.
CMS	9.	1.	0.	0.	128.
INCHES		11.88	15.02	15.02	15.02
MM		302.05	381.56	381.56	381.56
AC-FT		25.	31.	31.	31.
THOUS CU M		30.	39.	39.	39.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH B R K LAKE DAM (11002)

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
11002	1	0	0	0	1	0	0	0

ROUTING DATA

CLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-855.	-1

STAGE	855.00	855.62	856.25	856.50	856.87	857.50	858.37	859.12	859.87	860.62
FLOW	0.00	10.00	57.00	102.00	339.00	1273.00	2569.00	4147.00	5960.00	7982.00
CAPACITY=	0.	3.	47.	66.	266.					
ELEVATION=	850.	855.	857.	860.	880.					

CREL	SPWID	COOD	EXPW	ELEVL	COOL	CAREA	EXPL
855.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
856.5	0.0	0.0	0.

STATION 11002, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	2.	2.	2.	2.	3.	3.	3.	3.	3.
4.	4.	5.	5.	5.	5.	6.	6.	6.	6.
7.	7.	7.	7.	8.	8.	8.	8.	8.	9.

SUMMARY OF PMF AND ONE-HALF PMF FLOOD ROUTING

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-ALTERNATIVE ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 1.00	RATIO 2 .50
HYDROGRAPH AT	11002	.14	1	647.	324.
		.10)		18.33)(	9.17)(
ROUTED TO	11003	.24	1	500.	193.
		.19)		14.72)(	5.47)(

RATIOS APPLIED TO FLOWS

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALLE	SPILLWAY CREST	TOP OF DAM
ELEVATION	855.00	855.00	856.50
STORAGE	39.	39.	47.
OUTFLOW	0.	0.	102.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	857.02	.52	48.	520.	.83	15.67	0.00
.56	856.69	.19	47.	193.	.33	15.67	0.00

PERCENT OF PMF FLOOD ROUTING
EQUAL TO SPILLWAY CAPACITY

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE= 79/10/31.
TIME= 09.11.20.

DAM SAFETY INSPECTION - MISSOURI
[illegible] LAKE NO. [illegible] (11002)
PERCENT OF PMF DETERMINATION AND ROUTING

JOB SPECIFICATION

NPS	NMS	NPLN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
[illegible]	0	[illegible]	[illegible]	0	[illegible]	0	0	4	0

JXPSP	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 6 LRTIO= 1

RTIOS= [illegible] .36 .37 .38 .39 .40

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INPUT PRECIPITATION INDEX, RATIOS AND UNIT HYDROGRAPH PARAMETERS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
11002	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDC	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNO	ISAME	LOCAL
1	2	.04	0.00	.04	1.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.00	100.00	120.00	120.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-91.00	0.00	0.00

CURVE NO = -91.00 WETNESS = -1.00 EFFECT CN = 91.00

UNIT HYDROGRAPH DATA

TC= 0.00 LAG= .05

RECESSION DATA

STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 .35	RATIO 2 .36	RATIO 3 .37	RATIO 4 .38	RATIO 5 .39	RATIO 6 .40
HYDROGRAPH AT	11003	.04	1	227.	233.	240.	246.	252.	259.
		(.10)		(6.42)	(6.60)	(6.78)	(6.97)	(7.15)	(7.33)
ROUTED TO	11002	.04	1	84.	92.	96.	102.	108.	117.
		(.10)		(2.40)	(2.61)	(2.73)	(2.84)	(3.06)	(3.31)

B-27

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ..... INITIAL VALUE SPILLWAY CREST TOP OF DAM

ELEVATION	855.00	855.00	856.00
STORAGE	3[illegible].	39.	47.
OUTFLOW	0.	0.	102.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.35	[illegible]	0.00	4[illegible].	88.	0.00	15.75	0.00
.36	[illegible]	0.00	46.	92.	0.00	15.75	0.00
.37	856.47	0.00	46.	96.	0.00	15.75	0.00
.38	856.49	0.00	46.	100.	0.00	15.75	0.00
.39	856.51	.01	47.	104.	.08	15.75	0.00
.40	856.52	.02	47.	117.	.08	15.75	0.00


DATE:
TIME